Urban Green Spaces in the Mid 21st Century Scenarios and Trajectories for the Future Cityscapes – Case Study of a North European City

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Executive Summary

1. *Urbanization is the dominant land use change across the world.*
2. *Population growth, climate change and technological change are identified as three factors that have paramount importance in the historic, contemporary and future development of urban centres.*
3. *A critical review of current thinking relating to these three drivers allows for scenarios and trajectories to be identified and outlined.*
4. *The author concentrates, in this paper, on one possible trajectory: one that sees the a larger, ageing urban population living in smaller households, where climate change follows the predictions of the UK Climate Impacts Programme (UKCIP) and in which no cheap energy replacement is found to our current dependence on carbon.*
5. *Implications of these changes are discussed and used to illustrate how structure, both botanical and spatial, of urban green space may change.*
6. *Such evidence based scenarios of the future encourages decision-makers, planners, ecologists and other professions to engage in participatory discussions with urban dwellers regarding their futures.*

1 Introduction

The prevailing land use change across the world is towards an increase in the area devoted to human settlement (United Nations Centre for Human Settlements 1996) within which the importance of open spaces to the environment and to quality of life is increasingly recognized (De Groot, 1992; Ward Thompson, 2002; Chiesura, 2004). Reporting on the Greenwich Open Space Project (Burgess et al., 1988) state that the most highly valued open spaces are those that enhance the positive qualities of urban life: variety of opportunities and physical settings; sociability and cultural diversity. The project identified the need for diversity of both natural settings and social facilities within local areas. Research in environmental psychology suggests that people's desire for contact with nature serves an important adaptive function (van Den Berg et al., 2007), and there is abundant literature linking human health and well-being to the green elements of cities and towns (Tzoulas et al., 2007). Concern over 'urban ecological security' is giving rise to strategies to reconfigure cities and their infrastructures in ways that help to secure their ecological and material reproduction – i.e. their capacity and capability to secure the resources (e.g. water, energy, waste disposal and protection from flooding) required to guarantee their continued economic and social development (Hodson and Marvin, 2007). Three factors emerge as being paramount in the historic, contemporary and future development of urban areas: population growth, climate change and technological change. By drawing these three strands together it is possible to sketch out possible futures for urban society. This paper provides a brief discussion of the broad trends which can be fed into such a model and some of the emerging themes.

2 Methods: Trajectories for the future cityscapes

A simple model is to consider these three parameters as axes on which it is possible to consider each as showing change that is low, medium and high. This generates nine broad scenarios for the future. Such a simple model has many limitations but it is a useful tool to initiate discussions. In this paper the major trends feeding in to this model are outlined and they are then placed in the context of northern Europe.

2.1 Population

The United Nations Population Division (1999) estimate that the world population in 2000 was 6.06 billion and was set to rise to 8.4 billion by 2030. The proportion of people living in urban areas is forecast to increase from 47% in 2000 to 60% by 2030. In the UK there are three other significant trends: smaller households, often individuals living alone; the population is ageing; and cultural diversity continues to grow (in 2001 88% of the UK population described themselves as having a White British ethnic origin, the remaining 12% belonged to other ethnic groups) (Babb et

al., 2006). Such demographic changes lead to altered priorities for the use of open space and altered patterns of outdoor living. One example of a changing emphasis is that in January 2008 the UK's first playground specifically for older people was opened in Dam Head Park, Blackley, in north Manchester. Established by the Dam Head Residents Association, it includes equipment for upper body exercise, training leg muscles, hip exercise, and stomach and leg training. Some of the equipment is accessible to wheelchair users. Such developments indicate how usage of open space may change in the future.

2.2 Climate Change

The International Panel on Climate Change (IPCC) has produced a series of scenarios of future greenhouse gas emissions based on different views of how the world might develop. In brief the UK's mean annual temperature is expected to rise by 0.1-0.5°C per decade. Mean annual precipitation is predicted to decrease by up to 10% and this will be coupled with substantially less rainfall in the summer than is current. Annual cloud cover and relative humidity are expected to decrease by 3-9% by the 2080s and, hence, evaporation will increase. Soil moisture deficits will increase in line with the changes in precipitation and relative humidity. Average wind speeds are expected to change little. The frequency of extreme weather events are expected to rise (Bisgrove and Hadley, 2002). Plants have responded by physiological changes (such as developing fewer stomata) and by changes in distribution of the species (IPCC, 2007). However, evidence suggests that dispersal of many species will be too slow to respond to the changes anticipated in climate change scenarios. Ciesla (1995) and Van de Geijn et al. (1998) equated a 1°C rise with a geographical movement north of 100-200km. Given the 3-5°C rise in temperature (anticipated by the high emissions scenario) by the 2080s for the UK, a plant would need to migrate 4-7km each year to stay in the same climate. Plants adapted to the high temperatures of city centres may migrate to the cooler suburban areas but the overall effect will be the loss of species from the extant urban flora unless species tolerant of the higher temperatures are introduced by humans.

Trees and shrubs are vulnerable to summer drought, waterlogging and wind damage, and trees to toppling in high winds. Beech (Fagus sylvatica), pendunculate oak (Quercus robur) and lime (Tilia x europea) are all expected to suffer as temperatures increase, though the emergence of new varieties may mean that the plants survive if in different phenotypic forms. Birch (Betula pendula and other species) is tolerant of higher temperatures but its coping strategy is to shed its leaves. Thus in the summer a near-leafless birch tree would offer little shade or aesthetics for the urban dweller (Bisgrove and Hadley, 2002). These same authors quoting from White (1994) list tress which should benefit from extra warmth (Silver maple Acer saccharinum; Bitter nut Carya cordiformis; Yellow wood Cladrastis lutea; Turkish hazel Corylus columa; Smooth Arizona cypress Cupressus glabra; Italian Cypress). The cumulative effect is a changed urban natural environment with changed aesthetics.

Living roofs and green façades are potential design solutions which can be incorporated into buildings with the aim of addressing issues of urban heat islands, storm water run off and biodiversity. Such technologies bring the prospect of altering significantly the landscape of urban centres.

2.3 Technological Change

Economic growth in the twentieth century has been predicated on the availability of cheap energy. Initially this was cheap human labour later replaced by water, coal and latterly gas and oil fuelled machinery of today's society. Hubber (1956) predicted that production of oil from conventional sources would peak around 2015 - 2020. From that point oil production would decrease and hence availability would also decrease. This raises questions around the future of our cities in a world when oil resources are scarce. Driven by economic necessity the inhabitants of Havana, Cuba have developed urban agriculture. Open space is managed, planted and the crops tended. The concept of Ecopolis, often attributed to the architect Paul F. Downton, is a vision of a sustainable city that can feed and power itself with minimal reliance on the surrounding countryside, and creates the smallest possible eco-footprint for its residents. This results in a city that is friendly to the surrounding environment, in terms of pollution, land use, and alleviation of global warming. Totnes in southwest England is styling itself as "Transition Town Totnes, the UK's first town exploring how to prepare for a carbon constrained, energy lean world" (Transition Town Totnes, nd.). This is a community led project which is working towards the creation of an "energy decent action plan". Of the many activities forming part of this action plan there are plans to plant more trees, specifically almond (Prunus dulcis), walnut (Jugians sp), sweet chestnut (Castanea sativa), and heart nut (Jugians alantifolia) with the vision of Totnes becoming the Nut Capital of Britain; and the identification of land for allotments (a piece of public ground rented to individuals to grow vegetables). Both of these activities point towards changes in the open green space in this town.

Ward Thompson (2002) highlights the importance of new information technologies and the diverse impacts these are having on the way people live their lives. Such impacts impinge on the development of urban green space. New technologies will be developed to address the long-term shortage of hydrocarbon fuels: perhaps new forms of energy or new ways (new ideas) for food production and transportation.

3 Possible implications for a northern European city

This brief analysis outlined here is presented as a part of the continuing debate on city futures. Much time could be spent debating the details of the predictions and their implication. Whilst this is a worthwhile exercise, and one worthy of greater debate there is one issue that emerges from the discussion which merits further exploration: the importance of culture.

What then of the development of urban green spaces? Population rise and demographic changes will over the foreseeable future lead to increasing demands for more housing units to accommodate a population that lives in smaller households. Concerns over ecological security will result in city authorities developing local policies and strategies to ensure the supply of water, energy etc. such that each city is more self reliant than it is today. These changes could include food provision by increased urban agriculture. Practices to mitigate for climate change will see more green roofs and more green façades in order to provide cooling, storm water mitigation as well as biodiversity. Increasing housing density and higher fuel charges will lead to increased reliance on walking. As accessibility to countryside deceases, so the value of urban green spaces will increase. The plants within these areas will reflect the higher temperatures resulting from climate change.

References

Babb, P., Butcher, H., Church, J. and Zealey, L. (Eds) Social Trends Office for National Statistics. London

Bisgrove, R. and Hadley, P. (2002) *Gardening in the Global Greenhouse: The Impacts of Climate Change on Gardens in the UK*. Technical Report. UKCIP, Oxford

Burgess, J., Harrison, C.M. and Limb, M. (1988) People, Parks and the Urban Green – A Study of Popular Meanings and Values for Open Spaces in the City. Urban Studies, 25(6), 455–473

Chiesura, A., 2004. The role of urban parks for the sustainable city. Landscape and Urban Planning 68 (1), 129–138.

Ciesla, W.M. (1995) *Climate Change, Forests and Forest Management: an overview* FAO Forestry Paper 126, FAO, Rome

De Groot, R.S., 1992. Functions of Nature: Evaluation of Nature in Environmental Planning Management and Decision-Making. Wolters-Noordhoff, Amsterdam.

Hodson, M. and Marvin, S. (2007) Urban ecological security – the new urban paradigm Town & Country Planning 436-438

Hubbert, M.K. (1956) Nuclear Energy and the Fossil Fuels. Presented before the Spring Meeting of the Southern District, American Petroleum Institute. Plaza Hotel, San Antonio, Texas, March 7-8-9.

IPCC (2007) Climate Change 2007 – Impacts, Adaptation and Vulnerability

Contribution of Working Group II to the Fourth Assessment Report of the IPCC Cambridge University Press

Transition Town Totnes (nd.) Transition Town Totnes - Can You Imagine Totnes Beyond Oil? http://transitiontowns.org/Totnes/Main/HomePage Accessed 14 February 2008

Tzoulas, K., Korpela K., Venn, S., Yli-Pelkonen, V., Kázmierczak, A., Niemela, J., and James, P. (2007) Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review *Landscape and Urban Planning* 81 167–178

United Nations Centre for Human Settlements (1996) An urbanizing world: global report on human settlements, 1996. Oxford University Press. Oxford

United Nations Population Division (1999) World Urbanization Prospects: The 1999 Revision, New York, United Nations

van den Berg, A.E., Hartig, T. and Staats, H. (2007) Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability *Journal of Social Issues*, 63, 1 pp. 79--96 van de Geijn, S.C., Schapendonk, A.H.C.M. and Rotter, R. (1998) Effects of climate change on plant growth, crop yield and grassland productivity *Climate Change Impact on Agriculture and Forestry: advanced study course* European Commission.

Ward Thompson, C. (2002) Urban open space in the 21st century *Landscape and Urban Planning* 60 59-72

White, J. E. J. (1994) New tree species in a changing world *Arboricultural Journal* 18 99-112

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